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EMERGENT EEG IN 100 CASES OF ACUTE ENCEPHALOPATHY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Emergent EEG(eEEG) may be defined as any EEG done on an emergent basis. It often helps in identifying the etiology, rationalizing the therapy and prognosticating an underlying condition. Our aim of the study was to analyse the findings of eEEG done for 100 patients with acute encephalopathy admitted in Government Stanley Medical College Hospital. We analysed the findings of eEEG in 100 cases of acute encephalopathy admitted to Stanley Medical College Hospital between October 2018 and March 2019. The referral diagnoses and eEEG findings were correlated with the utility classification of the eEEG. eEEGs were performed on 100 patients (56 males and 44 females) of mean age 57.13 (range 13 years to 90 years). eEEGs when carried out for epilepsy related indications (status epilepticus, recurrent seizures and nonconvulsive status) were more useful when compared to those carried out for other indications.

INTRODUCTION :

Emergent EEG(eEEG) may be defined as any EEG done on an emergent basis. It often helps in identifying the etiology, rationalizing the therapy and prognosticating an underlying condition. The indications, practices, and usefulness of eEEG have not been defined clearly until now[1]. eEEG is expensive as it requires considerable professional expertise to maintain a 24 h eEEG service. The relative utility of such service needs careful analysis in order to optimize the performance and justify its usage. The availability of eEEG is often restricted because of scarcity of technical expertise, administrative and financial constraints [2] Despite these shortcomings, the potential morbidity and mortality associated with the conditions suspected, justify the use of eEEG in certain conditions.

In developing countries, eEEG is often ordered in the evaluation of encephalitis or metabolic encephalopathy when more definitive diagnostic procedures are not available or are prohibitively expensive. Our aim of the study was to analyse the findings of eEEG done for 100 patients with acute encephalopathy admitted in Government Stanley Medical College Hospital.

MATERIAL AND METHODS :

This study was carried out in the Department of Neurology of Stanley Medical College Hospital at Chennai which is a tertiary care Institute. The Electroencephalograpy Section carries out around 25 digital EEGs every day in addition to maintaining 24 h video EEG suites for syndromic diagnosis, characterization of events and presurgical workup of drug refractory epilepsy patients. eEEG was done at the Zero delay ward and Intensive Care Unit round the clock; a trained neurotechnologist performs the EEG and a Neurologist /Neurology resident does provisional reporting if required. All eEEGs are subsequently examined and reported by an Epileptologist.

We analysed the findings of eEEG in 100 cases of acute encephalopathy admitted to the Casualty, Zero delay ward and Intensive Care Unit of Stanley Medical College Hospital between October 2018 and March 2019. For the purpose of this study, emergent EEG (eEEG) was defined as an EEG performed on a non-elective basis upon request from a clinician for a seemingly emergency indication. Neonatal EEGs were not included. All recordings were carried out on 16-channel digital EEG acquisition system, with the scalp electrodes placed according to the International 10–20 system. Standard activation procedures were employed whenever possible. Response to pain and other physiological stimuli were recorded in situations of altered sensorium.

A systematic chart review of each case was carried out in order to abstract all clinical data, referring diagnosis, final diagnosis and outcome at the time of discharge. The eEEG diagnosis, final clinical diagnosis as well as the outcome at discharge were recorded. We have arbitrarily classified the eEEGs as (1) useful—if it had helped in diagnosis, therapy or exclusion of any specific condition (2) not useful or (3) only corroborative—if the eEEG revealed certain abnormalities (e.g. nonspecific slowing) but did not help the clinician to make any specific diagnosis or make definitive changes in therapy. The clinical outcome of the patients at the time of discharge was classified arbitrarily into (A) no disability or return to the pre-hospitalization status, (B) mild to moderate disability but independent for most activities of daily living, (C) severe disability or complete dependence on others for all activities of daily living, and (D) hospital death or

persistent vegetative state. Statistical analysis was performed using the c^2 test or Fisher's exact test when indicated. The referral diagnoses and eEEG characteristics were correlated with the utility classification of the eEEG. Those with P-value <0.05 were considered significant.

RESULTS :

eEEGs were performed on 100 patients (56 males and 44 females) of mean age 57.13 (range 13 years to 90 years). The provisional report was provided to the clinician soon after the study and a formal report by the epileptologist was provided within the next working day. The chief clinical referrals and eEEG findings are given in , respectively. On univariate analysis, the usefulness of eEEG varied according to the referral diagnosis (). Out of the eEEG findings, nonconvulsive status, discrete seizures, epileptiform discharges, periodic lateralized epileptiform discharges (PLED's) and burst suppression were significantly correlated with usefulness, while nonspecific dysfunction were not found useful. (). Overall, 34 of the eEEGs were useful, 35 were only corroborative and 31 were not useful.

eEEGs when carried out for epilepsy related indications (status epilepticus, recurrent seizures and nonconvulsive status) were more useful when compared to those carried out for other indications. The specific abnormalities noted in the eEEGs included electrograhic seizures, Periodic Lateralized Epileptiform Discharges (PLEDs), Triphasic waves, Burst suppression pattern and interictal epileptiform discharges (IED's) (Table 2). Significantly worse clinical outcome (outcome C and D) was seen with burst suppression pattern , generalized suppression and electro cerebral silence ().

Table 1: Usefulness of the eEEG based on diagnosis

Diagnosis	No. (%)	eEEG findings Useful	eEEG findings Corroborative	eEEG findings Not Useful	p value
Meningoencephalitis	7 (6.7%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	0.407
Hepatic Encephalopathy	3 (2.8%)	3 (100%)	0	0	0.050
Hypoxic Encephalopathy	4 (3.8%)	2 (50%)	1 (25%)	1 (25%)	0.786
Metabolic Encephalopathy	44 (41.9%)	12 (27.3%)	13 (29.5%)	19 (43.2%)	0.065
Septic Encephalopathy	7 (6.7%)	3 (42.9%)	2 (28.6%)	2 (28.6%)	0.871
Stroke	34 (32.4%)	11 (32.4%)	16 (47.1%)	7 (20.6%)	0.136
Status Epilepticus	3 (2.8%)	2 (66.7%)	1 (33.3%)	0	0.381
Tuberculous Meningoencephalitis	3 (2.8%)	1 (33.3%)	2 (66.7%)	0	0.397
TOTAL	105*	36	39	30	

*Some patients had more than one diagnosis

Table 2: eEEG findings in various clinical conditions

Diagnosis	Reactivity	Triphasic Waves	Burst Suppression	PLEDs	Electrographic Seizure	FIRDA	IED	NCSE	Generalized Suppression	Focal and Generalized Slowing
Meningoencephalitis	2 (40%)	0	0	0	0	0	0	0	0	3 (60%)
Hepatic Encephalopathy	2 (33.3%)	3 (50%)	0	0	0	0	1(16.7%)	0	0	0
Hypoxic Encephalopathy	2 (40%)	0	1 (20%)	0	0	0	0	0	1 (20%)	1 (20%)
Metabolic Encephalopathy	35 (66%)	1 (1.8%)	0	0	3 (5.6%)	2 (3.7%)	5 (9.4%)	0	2 (3.7%)	5 (9.4%)
Septic Encephalopathy	3 (33.3%)	1 (11.1%)	1 (11.1%)	0	0	0	1 (11.1%)	0	1 (11.1%)	2 (22.2%)
Stroke	22 (51.1%)	1 (2.3%)	2 (4.6%)	2 (4.6%)	2 (4.6%)	0	7 (16.2%)	1 (2.3%)	1 (2.3%)	5 (11.6%)
Status Epilepticus	3 (60%)	0	0	0	1 (20%)	0	1 (20%)	0	0	0
Tuberculous Meningoencephalitis	2 (66.6%)	0	0	0	0	1 (33.4%)	0	0	0	0

Table 3: eEEG findings and its association with clinical outcomes

eEEG finding	Outcome Class A	Outcome Class B	Outcome Class C	Outcome Class D	p value
Reactivity	12 (16.2%)	18 (24.3%)	20 (27%)	24 (32.4%)	0.002
Triphasic Waves	1 (16.7%)	1 (16.7%)	0	4 (66.7%)	0.437
Burst Suppression	0	0	0	4 (100%)	0.124
PLEDs	0	0	0	2 (100%)	0.421
Electrographic Seizures	1 (16.7%)	0	2 (33.3%)	3 (50%)	0.704
FIRDA	1 (25%)	1 (25%)	0	2 (50%)	0.623
IED	1 (7.1%)	1 (7.1%)	8 (57.1%)	4 (28.6%)	0.053
NCSE	0	0	0	1 (100%)	0.707
Generalized Suppression	0	0	1 (20%)	4 (80%)	0.316
Focal and Generalized Slowing	2 (13.3%)	1 (6.7%)	5 (33.3%)	7 (46.7%)	0.656

DISCUSSION :

Emergent EEG has been variably defined as any EEG study requested for immediate performance during non-business hours [2], any EEG done to exclude nonconvulsive status epilepticus with round the clock availability and after approval by the neurology or neurosurgery services[3] or any EEG requested on an emergent basis and actually performed within one hour[1]. It requires considerable organization, machine and manpower within the clinical neurophysiology department in order to provide 24 h EEG service on an emergent basis. Our objective in this study was to analyse the findings of e EEG done for 100 patients with acute

encephalopathy. Accordingly, we had defined an eEEG as one performed on non-elective basis upon request from a clinician for a seemingly emergent indication.

The overall usefulness of eEEG in our study (34%) was less than that reported in a study by [4]. The tendency to request eEEG for any encephalo-pathy or encephalitis reflects the limitations (due to non availability or prohibitive cost) in getting specific bio-chemical and microbiological investigations on an emergent basis. eEEG provides a less specific but more readily available laboratory tool to manage these neurological emergencies in a developing country. Our data indicates that an eEEG is more likely to provide useful information in the setting of seizure disorders than other conditions similar to a study done by [5].

Not many studies have analysed the impact of eEEG on the management or prognosis . Specific EEG patterns in the eEEG had a correlation with clinical usefulness of the service. Presence of electrographic seizures, nonconvulsive status, epilepti-form discharges, and generalized suppression pattern in eEEG correlated with usefulness while triphasic waves had statistically significant usefulness in hepatic encephalopathy. On the contrary, nonspecific dysfunction and slowing of background activity, though the commonest abnormality noticed in eEEG, did not influence clinical decision-making. There was a significant correlation between certain specific eEEG findings (burst suppression pattern and generalized suppression) and poor clinical outcome (outcome C and D). Poor outcome had been associated with similar EEG findings in earlier studies done by There are several limitations for this study. The sample size (100) of the study has limited the statistical significance of its results and definition of eEEG was arbitrary . The definition of usefulness was wide, but satisfied the broad purpose of our study.

CONCLUSION :

eEEG provides useful information mostly in selected situations such as epilepsy related indications, hypoxic encephalopathy and brain death examination. In conditions like encephalitis, acute disseminated encephalomyelitis, uncertain encephalopathies and metabolic encephalopathy, the eEEG findings were less useful for clinical decision-making and should be used judiciously. Epilepsy related emergencies are most likely to benefit from eEEG. Certain specific eEEG patterns appear to correlate with poor outcome as against nonspecific slowing. Individual institutions, particularly those in developing countries where resources are limited, need to develop appropriate protocols for eEEG services wherein the clinical benefit is carefully balanced against the availability of resources[8].

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